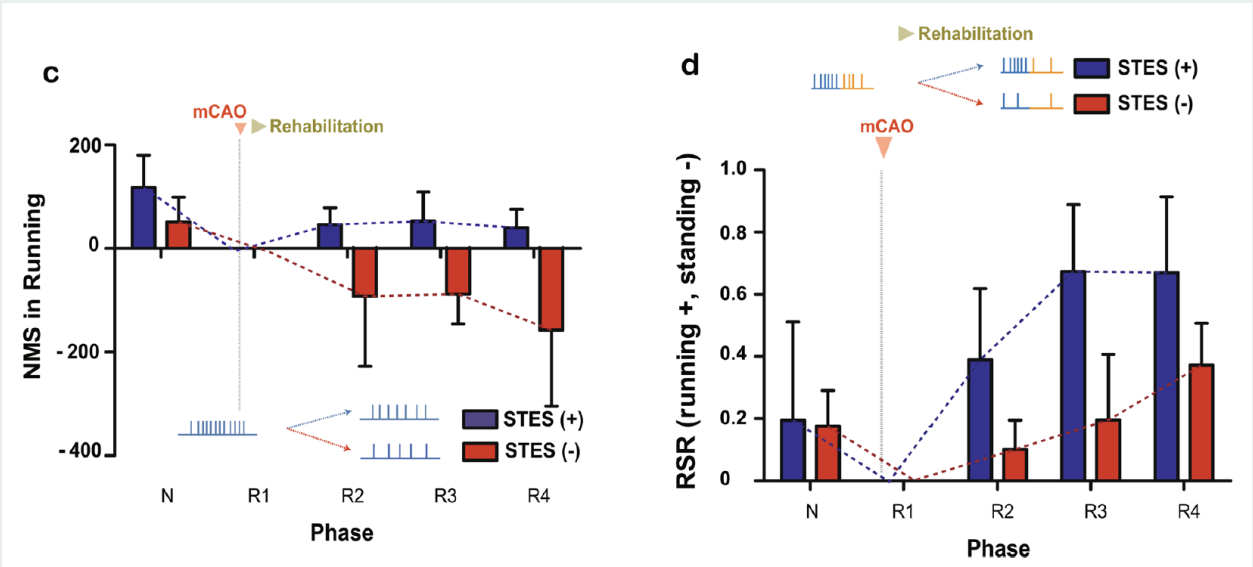
Quarterly Research Newsletter

BRAIN MODULATION FOR NEURORECOVERY

Subthreshold Electrical Stimulation (STES) for Stroke Rehabilitation: Kim *et al.* in recent Scientific Report demonstrated, via simulation and experimental data, that STES can serve as an energy-saving but viable option in post-stroke neurorecovery, when combined with early rehabilitation. They used 30 minutes 50 Hz charge-balanced square wave stimulation with 20-50 μA amplitude, 200 μs pulse width and 40 μs interval between negative and positive arms of the pulse as STES in layer V of M1 in rats, combined with rotarod running task as soon as possible after inducing mCAO stroke. Using histology (to quantify lesion volume) and MAP2 expression (to quantify neural plasticity), they concluded that STES failed to prevent total structural damage from the infarction in the brain after mCAO but did modulate the neural plasticity that may promote recovery of motor function. They used number of multi-unit spikes (NMS) and ratio between standing and running (RSR) as outcome measures and found both of them to be significantly different between the group that did (STES+) or not (STES-) receive the stimulation.



Kim, K., S. J. Yoo, S. Y. Kim, T. Lee, S. H. Lim, J. E. Jang, M. Je, C. Moon and J. W. Choi (2021). "Subthreshold electrical stimulation as a low power electrical treatment for stroke rehabilitation." Sci Rep 11(1): 14048.

Upcoming events

7th European Stroke Conference (ESOC 2021)
1st September 2021 - 3rd September 2021
Virtual Conference
W: http://www.eso-conference.org

WCN2021
25th World Congress of Neurology
3rd October 2021 - 7th October 2021
Rome, Italy
W: http://2021.wcn-neurology.com

36th Congress of SOFMER
14th October 2021 - 16th October 2021
Lille, France
W: http://www.sofmer.com

13th World Stroke Congress
28th October 2021 - 29th October 2021
Virtual
W: http://www.worldstrokecongress.org

4th International Brain Stimulation Conference
6th December 2021 - 9th December 2021
Charleston, SC, United States
W: https://www.elsevier.com/events/conferences/international-brain-stimulation-conference

European Congress of Neurorehabilitation 2021 jointly with 27th Annual Meeting of the German Society of Neurorehabilitation
8th December 2021 - 11th December 2021
Berlin, Germany
W: http://www.efnr-congress.org

2021 American Society of Neurorehabilitation Virtual Annual Meeting
30th March 2022 – 1st April 2022
Ritz Carlton Hotel, St. Louis, MO, United States
W: https://www.asnr.com/i4a/pages/index.cfm?pageid=3851

From the desk of Wayne Feng, MD, MS. Neuromodulation and Stroke Recovery Lab, Duke University School of Medicine | Comments? wayne.feng@duke.edu, pratik.chhatbar@duke.edu

Select Publications of Brainmodulation for Neurorehabilitation for 2021

ID	TYPE*	TOOL	DISEASE	CITATION
1	1	tDCS	Consciousness	Aloi D, Della Rocchetta AI, Ditchfield A, Coulborn S, Fernandez-Espejo D. Therapeutic use of transcranial direct current stimulation in the rehabilitation of prolonged disorders of consciousness. Front Neurol. 2021;12:632572
2	1	rTMS	Aphasia	Arheix-Parras S, Barrios C, Python G, Cogne M, Sibon I, Engelhardt M, et al. A systematic review of repetitive transcranial magnetic stimulation in aphasia rehabilitation: Leads for future studies. Neurosci Biobehav Rev. 2021;127:212-241
3	1	EEG+FES	Stroke	Chen L, Gu B, Wang Z, Zhang L, Xu M, Liu S, et al. Eeg-controlled functional electrical stimulation rehabilitation for chronic stroke: System design and clinical application. Front Med. 2021
4	1	tDCS	Walking+ Executive	Clark DJ, Chatterjee SA, Skinner JW, Lysne PE, Sumonthee C, Wu SS, et al. Combining frontal transcranial direct current stimulation with walking rehabilitation to enhance mobility and executive function: A pilot clinical trial. Neuromodulation. 2021;24:950-959
5	1	VNS	Stroke	Dawson J, Liu CY, Francisco GE, Cramer SC, Wolf SL, Dixit A, et al. Vagus nerve stimulation paired with rehabilitation for upper limb motor function after ischaemic stroke (vns-rehab): A randomised, blinded, pivotal, device trial. Lancet. 2021;397:1545-1553
6	2	NIBS	TBI	Hara T, Shanmugalingam A, McIntyre A, Burhan AM. The effect of non-invasive brain stimulation (nibs) on executive functioning, attention and memory in rehabilitation patients with traumatic brain injury: A systematic review. Diagnostics (Basel). 2021;11
7	2	NIBS	Stroke	Hara T, Shanmugalingam A, McIntyre A, Burhan AM. The effect of non-invasive brain stimulation (nibs) on attention and memory function in stroke rehabilitation patients: A systematic review and meta-analysis. Diagnostics (Basel). 2021;11
8	1	BCI+FES	SCI	Jovanovic LI, Kapadia N, Zivanovic V, Rademeyer HJ, Alavinia M, McGillivray C, et al. Brain-computer interface-triggered functional electrical stimulation therapy for rehabilitation of reaching and grasping after spinal cord injury: A feasibility study. Spinal Cord Ser Cases. 2021;7:24
9	1	tDCS+VR	Stroke	Lee S, Cha H. The effect of clinical application of transcranial direct current stimulation combined with non-immersive virtual reality rehabilitation in stroke patients. Technol Health Care. 2021
10	1	FES	Stroke	Lim J, Lim T, Lee J, Sim J, Chang H, Yoon B, et al. Patient-specific functional electrical stimulation strategy based on muscle synergy and walking posture analysis for gait rehabilitation of stroke patients. J Int Med Res. 2021;49:3000605211016782
11	1	FES	Stroke	Martin-Odriozola A, Rodriguez-de-Pablo C, Zabaleta-Rekondo H. Hand dexterity rehabilitation using selective functional electrical stimulation in a person with stroke. BMJ Case Rep. 2021;14
12	1	FES	Stroke	Minami S, Fukumoto Y, Kobayashi R, Aoki H, Aoyama T. Effect of home-based rehabilitation of purposeful activity-based electrical stimulation therapy for chronic stroke survivors: A crossover randomized controlled trial. Restor Neurol Neurosci. 2021;39:173-180
13	2	tDCS	Stroke	Navarro-Lopez V, Del Valle-Gratacos M, Fernandez-Matias R, Carratala-Tejada M, Cuesta-Gomez A, Molina-Rueda F. The long-term maintenance of upper limb motor improvements following transcranial direct current stimulation combined with rehabilitation in people with stroke: A systematic review of randomized sham-controlled trials. Sensors (Basel). 2021;21
14	2	NIBS+Robotics	Stroke	Reis SB, Bernardo WM, Oshiro CA, Krebs HI, Conforto AB. Effects of robotic therapy associated with noninvasive brain stimulation on upper-limb rehabilitation after stroke: Systematic review and meta-analysis of randomized clinical trials. Neurorehabil Neural Repair. 2021;35:256-266
15	2	PAS	SCI	Shulga A, Lioumis P, Kirveskari E, Savolainen S, Makela JP. A novel paired associative stimulation protocol with a high-frequency peripheral component: A review on results in spinal cord injury rehabilitation. Eur J Neurosci. 2021;53:3242-3257
16	1	FES	Stroke	van Bloemendaal M, Bus SA, Nollet F, Geurts ACH, Beelen A. Feasibility and preliminary efficacy of gait training assisted by multichannel functional electrical stimulation in early stroke rehabilitation: A pilot randomized controlled trial. Neurorehabil Neural Repair. 2021;35:131-144

** 1 = Experimental, 2 = Review*